MSB TECHNOLOGY SIGNATURE DAC IV PLUS

Can it be a year since I had the guilty pleasure of listening to an MSB DAC? Given that it's almost 50 weeks since I reviewed the MSB Platinum DAC IV, I guess that it is. Which means that every time I have reviewed a DAC since that time, I have longed to hear the MSB again. Indeed I still dream of having an MSB Platinum DAC IV in my system but, alas, the sad state of my finances continues to preclude what would indeed be a joyous state of affairs.

So when reviews editor Edgar Kramer said that he'd managed to obtain an MSB Signature DAC IV *Plus* for review…and for an extended review period, at that… my joy knew no bounds. (Well, perhaps one bound, because I knew that once I'd finished the review, I'd have to hand it back!). And when I say 'managed to obtain', I mean that in a most admiring sense, because MSB actually hand-builds all its products to order. There is no warehouse in the company's factory in California that is filled with MSB DACs awaiting shipping, only a small team of technicians who assemble each MSB DAC only after a customer has placed a specific order with a dealer.

The reason for this 'built-to-order' process is that MSB offers its customers what I personally think is a bewildering array of options for each of its products. Almost everything inside each DAC is available in different performance/quality levels, from the actual digital-to-analogue converters themselves (made in-house by MSB itself, about which more in a moment), to the internal clocks, to the oversampling circuits, to the filters, to the volume controls, to the power supplies… and not forgetting you can option in various types of inputs and outputs (balanced, unbalanced, ProI2S, USB [in two versions]) and… almost forgot… you can order almost any type of colour finish you want.

Although I (and not a few other reviewers) think the options available are 'bewildering' it seems MSB's customers think otherwise, because according to MSB's

founder, Larry S. Gullman, it's only reviewers who are bewildered. When I interviewed him earlier this year (an interview which will soon appear in this magazine) he told me that MSB's customers had no problems at all ordering the specific circuits they wanted and that, due to the variety of options available for all MSB components, very few MSB products are ever exactly the same. So when you buy an MSB product, you're essentially buying a 'one-off' component: in other words, it's possible but also unlikely that anyone else in the world will have one that's identical.

If you'd like to get a feeling for the range of options that available for just the MSB Signature DAC IV, I created this link [www.tinyurl.com/msb-options] where you can go to see an easy-to-navigate form that shows you all the options available for just this single product. I counted 26 options, but there are actually more available, for example MSB's iLink upgrade, that aren't mentioned on this page. It's important to note that neither the DAC IV nor the Signature Data CD IV transport have power supplies built in. You have to attach an external MSB power supply, of which four different types are available: Standard, Signature, Diamond and Signature Transport, all of which can be ordered with or without a front-mount power switch and remote control. (Most of MSB's power supplies will power both a transport and a DAC, which is why there's only one power supply pictured with the components in this review, but you can choose to power components individually if you wish, using one supply for each component.)

The MSB Signature DAC IV *Plus* loaned to me from Australian importer Audio Fidelity had BNC, coaxial, Toslink, balanced AES/EBU, and balanced analog inputs, plus an RS232 control port. It was also fitted with the 'Diamond' volume control and the 'Femto 140' clock, as well as the Digital Filter Suite and Upsampling. It also contained four Signature Platinum Sign Magnitude 24-bit digital-to-analogue converters. As I said earlier, these DACs are unique for several reasons. First, they're made in-house by MSB itself—they're not just 'off-the-shelf' from the usual multinational suppliers. (To my knowledge, MSB is the only hi-fi manufacturer in the world that actually builds its own DACs). Second, these hand-made DACs use 'ladder' conversion system, rather than the more usual Delta-Sigma conversion. Third, the 'ladder' is built using the more unusual (and more accurate) sign-magnitude implementation. Fourth, whereas most 'ladder' DACs produce a current output, which then needs a separate conversion to a voltage output before it can drive a power amplifier, MSB's DAC is a true voltage type, so no current-to-voltage conversion is required.

For all its internal complexity, the Signature DAC IV *Plus* is controlled via just three of the four controls on the front panel, thanks to a deeply-layered software menu system. (The fourth control, emblazoned with a 'star' sign, is a user-defined control that can be programmed by the user to perform a specific function, so you can do it quickly and easily without delving down through the menu layers. By default, the button inverts phase, but if you find that in day-to-day use you regularly use a particular digital filter, or turn upsampling on and off depending on what you're playing, you can allocate that function to the 'star' button so it switches that function rather than invert phase.)

The Signature DAC IV *Plus*, as reviewed, retails for $22,170, to which you have to add a Signature PowerBase ($4,995) so the total cost is actually $27,165. However, if you forgo all the options (which you can add later if you want) the total cost (including the Signature Power Base) would be $22,990.

OPERATION AND LISTENING SESSIONS

If you have multiple devices connected to the Signature DAC IV *Plus*, you'll love the automatic input switching. This detects when there's a signal present at the Signature DAC IV *Plus*' input, and switches to it automatically. If more than one signal is present, it switches to the highest-priority input (MSB2 is the highest, analogue the lowest) of the several that are present. Of course you can override the automatic switching anytime you like, but it worked perfectly for me, and meant one less thing to worry about.

I found that getting to grips with using the menu system to implement the various options was a little tricky at first, but the longer I used the player, the less I had to refer to the hierarchical block diagram of menu structure that stretches over pages 12, 13 and 14 (!) of the Users Manual. To give you an idea, these are the basic options: Upsampling (Off/ On); Phase Invert

MSB SIGNATURE DAC IV PLUS

Brand: MSB
Model: Signature DAC IV Plus
Category: DAC
RRP: $27,165 (inc. Signature PowerBase)
Warranty: One Year
Distributor: Audio Fidelity Australia
T: 1300 343 354
E: sales@audiofidelity.com.au
W: www.audiofidelity.com.au

Uniqueness
Performance
Upgradeability

Cost
Complexity
Lack of presets

LAB REPORT: Turn to page 61
Test results apply to review sample only.

(Off/On); Filter Select (32×, 16×, Lanczos, Min Phase, Temporary); Upsampler Select (1/2/3); Reclocking (On/Off); DAC Level (+3dB, 0dB, –3dB, –6dB, –9dB); Dither (On/Off); Start-up volume (0 to –69dB); Maximum volume (0dB to –30dB); and Volume Steps (1.0dB/0.5dB/0.25dB). (There are more!)

I had a love/hate relationship with the Signature DAC IV *Plus*' display. I loved the fact that it shows the sample rate and bit depth of the signal you're inputting, but I thought the characters on the display itself were rather 'blocky' and disliked the fact that the 'minus' sign was too high in the display in relation to the numerals. (Must be the typesetter in me!) At least MSB has now made sure that its front panel logos and fonts are identical, rather than being different from component to component! (Though they still haven't fixed the errors in the manual explaining how DACs work.)

But if I had a love/hate relationship with the display, my relationship with the sound quality of MSB's Signature DAC IV *Plus* was just plain, ol', idolising love… in fact there wasn't any aspect of the sound I didn't idolise: to my ears, it was perfect sound—exactly what Philips and Sony promised when they introduced the CD format 'way back in the 80s. No matter what I played, I heard rock-solid, depthy, tuneful bass, glorious midrange and a pure, beautifully-extended treble with nary a trace of harshness. Sure I could alter the 'quality' of the treble by altering the filters or the upsampling, and the other variables, but the quality of the sound I heard always remained clean and pure despite the changes… it just sounded 'different' with each different setting.

One of the first discs I played was Josh Pyke's newest CD (and his fourth studio album), 'The Beginning and the End of Everything', and thanks to the MSB, Pyke had me with the very first track, *Bug-Eyed Beauty*. It kicks off with a to-die-for multi-voice *a Capella* intro and then a close-miked acoustic guitar cuts in. I could feel the hairs on the back of my neck rising, just as they should when everything is coming together so well it seems that there's just no other way to put it together any better. Recording quality is exceptional, which is great because there's a lot going on and, thanks to the MSB's uncanny ability to separate out all the different strands of the music, I could hear absolutely everything with the kind of clarity that seemed almost supernatural. *Haunt You Love* (Track 4) is so beautifully conceived, from the deconstructed piano to the non-banjo-likeness of the banjo that I just had to play it again immediately after hearing it the first time: It's great music-making.

One of the marks of a great audio component, whether it's a DAC, as in this case, or an amp, or a pair of speakers… or whatever… is that I always feel compelled to hear how it sounds when it's playing other music… and often the music I feel compelled to play is at such an emotional, primaeval level that I have no idea why I'm wanting to hear it. For example, after listening to 'The Beginning and the End of Everything' four times through, each one on a different filter setting (for the record, I preferred Filter 1, at 32×), I scoured my shelves to find Archie Roach's album 'Into the Bloodstream', which I hadn't played for a year. It's an album that's as full of pain as it's full of joy, but it's also outright funny at times as well, both musically and lyrically (I'm thinking *Big Black Train*). There's some lovely Hammond (courtesy Craig Pilkington) and some gorgeous gospel moments thanks to St Brigid's and friends. Cameos from Vika and Linda Bull, Paul Kelly, Emma Donovan and others are great, but in the end it's Roach who shines brightest. The MSB made his music visceral…as close to truth as I think it's possible to be.

CONCLUSION

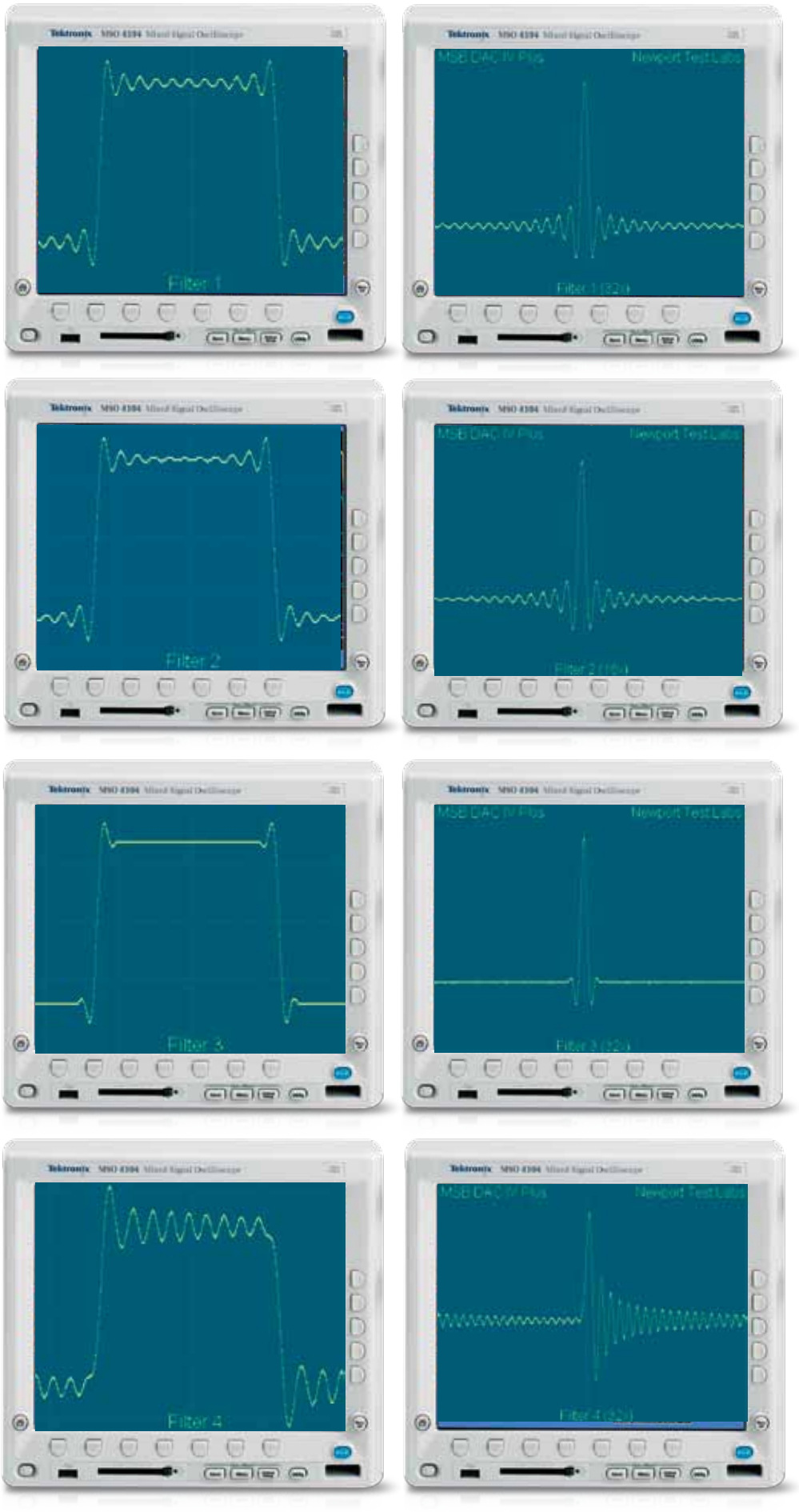
What do you get if you buy an MSB Signature DAC IV *Plus*? A hand-built component, made in the good ol' US of A, that's likely to be a 'unique' one-off DAC due to the number of options available. The build quality is outrageously good, the circuitry is state-of-the-art, the sound is sublime and, if you can't afford it, you can always dream about it! ***greg borrowman***

LABORATORY TEST RESULTS

Newport Test Labs tested the Signature DAC IV *Plus* using two methods. One involved using a standard Philips Test CD, played via an MSB transport, so the original test signals were 44.1kHz/16-bit. The other involved testing the DAC directly, by injecting 48kHz/24-bit test signals into the digital input, then measuring the analogue output. Obviously, performance was superior with the higher-quality 48/24 test signals, but the MSB still performed brilliantly-well with the 'lower-quality' CD-standard signals, which will be good news to all those who still use CDs (and SACDs) as their primary music source.

You can see from Graph 1 that there was some distortion present in the output with the CD test signals, but it was all very low in level, with the second harmonic at –82dB (0.007%) the third at –90dB (0.003%) and all others essentially at or below –100dB (0.001%). Graph 2 shows that it's likely the second and third harmonic distortion components shown in Graph 1 were in the analogue output stage, because at this slightly lower recorded level (–6dB) they've both dropped down below –110dB (0.0003%). The higher-order components are still present, at much the same levels, so this is more likely to be the DAC itself.

The performance of the MSB DAC improves with decreasing signal level, and you can see that at –60dB, there's essentially no harmonically-related distortion, and all sampling products are around 120dB down (0.0001% THD). Graph 4 shows performance with an undithered 44.1/16 signal at a recorded level of –91.24dB (the leftmost peak on the graph). You can see a third harmonic at –100dB (0.001%), then odd-order harmonics out to 20kHz. As all signals from a music CD will be dithered, it makes more sense to look at Graph 5, which shows a test signal recorded at a similar level (–90.31dB) but with dithering. You can see that now only the test signal is visible on the graph, plus a little low-frequency noise (the signal at the extreme left of the graph). Excellent performance.



CCIF intermodulation distortion revealed a couple of high-frequency sidebands alongside the 19kHz and 20kHz test signals (at 18kHz and 21kHz respectively, both around 75dB down) plus a regenerated 1kHz signal around 100dB down. The performance with this test changed quite significantly depending on the filtering configuration used, as you'd expect.

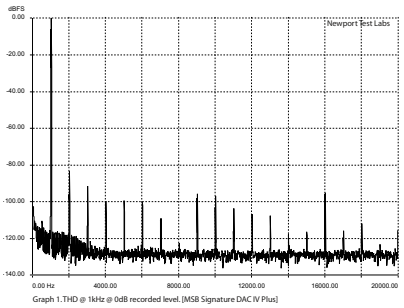
The frequency response of the MSB Signature DAC IV *Plus* is shown in Graph 7. Ignore the small bit of trace 'missing' at the extreme left, which is caused by a small delay in the test equipment being able to acquire the low-frequency signal for measuring. (The frequency response extends well below 20.56Hz too, that's just the low-frequency graphing limit. As you can see, the response is incredibly linear, and although there are small perturbations in level in the response above 3kHz, you need to bear in mind the vertical scale of the graph, which has been expanded enormously, so the lines above and below the 0dB reference line are at +0.02dB and –0.02dB respectively. On a 'standard' graph

> *The engineering and quality control systems at MSB must be truly amazing.*

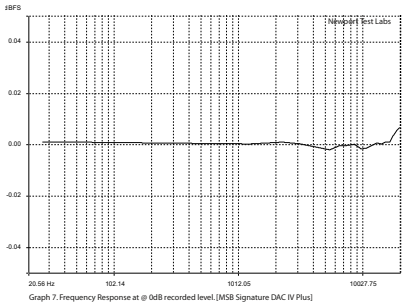
scale, the response would look like it had been drawn with a ruler. Performance with an impulse train is shown in Graph 8 and you can see the extreme cut-off of the digital filter, plus the linearity from 0Hz right up to 21kHz. Excellent performance yet again.

Channel separation was measured at 116dB at 16Hz, 121dB at 1kHz and 143dB at 20kHz. All three results are good, but the result at 20kHz is exceptional. Also exceptional was channel balance, which *Newport Test Labs* measured at 0.001dB. I can't quite conceive how MSB achieves these levels: the engineering and quality control must be amazing. Interchannel phase error was non-existent at low and midrange frequencies, and the 0.56° error noted at 20kHz would be completely inaudible under any listening conditions. Some group delay is evident, as tabulated, but it's far lower than for almost every other DAC I've ever seen… and those that have returned figures that are in the same ballpark as this MSB are equivalently-priced, or more expensive yet again.

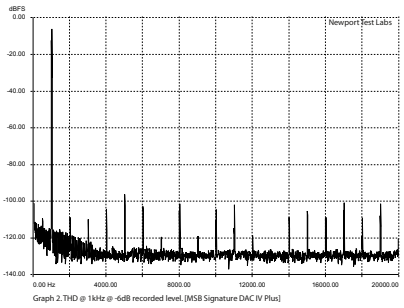
Signal-to-noise ratios (and remember that



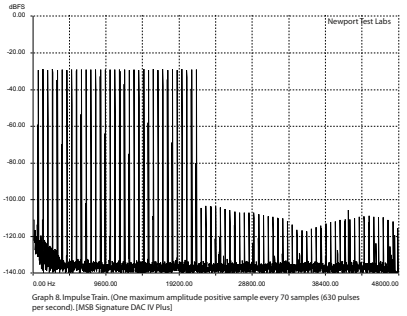
Graph 1. THD @ 1kHz @ 0dB recorded level. [MSB Signature DAC IV Plus]



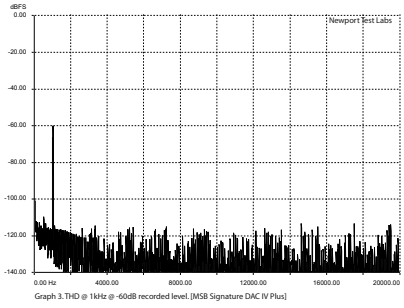
Graph 7. Frequency Response at @ 0dB recorded level. [MSB Signature DAC IV Plus]



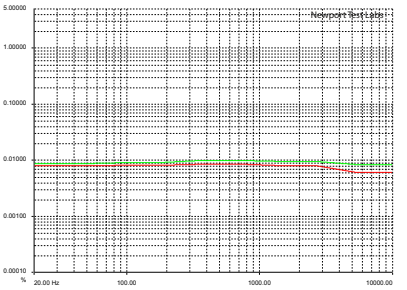
Graph 2. THD @ 1kHz @ -6dB recorded level. [MSB Signature DAC IV Plus]



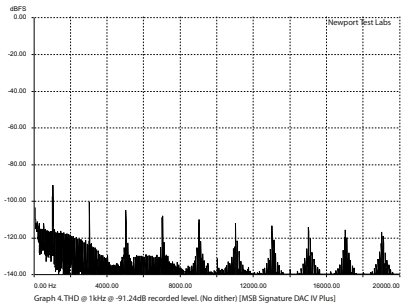
Graph 8. Impulse Train. (One maximum amplitude positive sample every 70 samples (630 pulses per second). [MSB Signature DAC IV Plus]



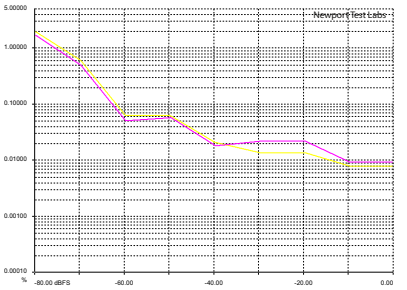
Graph 3. THD @ 1kHz @ -60dB recorded level. [MSB Signature DAC IV Plus]



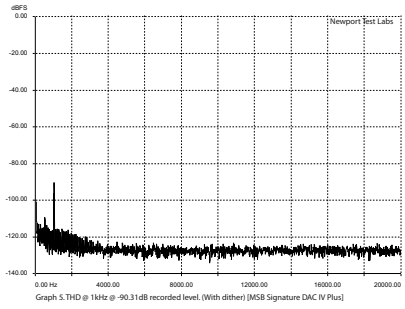
Graph 9: Total Harmonic Distortion & Noise (THD+N) vs Frequency at -20dB (Green Trace) and -1dB (Red Trace). Digital input. 24-bit/48kHz. [MSB Signature DAC IV+]



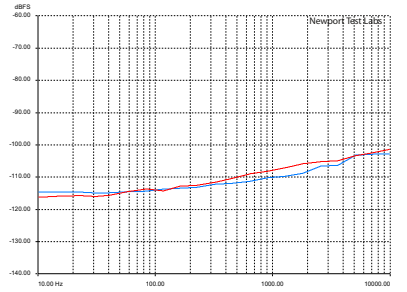
Graph 4. THD @ 1kHz @ -91.24dB recorded level. (No dither) [MSB Signature DAC IV Plus]



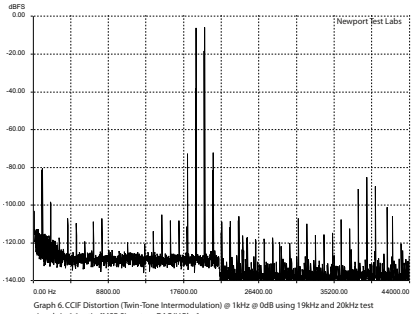
Graph 10: THD vs Level. Digital input. 24-bit/48kHz. [MSB Signature DAC IV Plus]



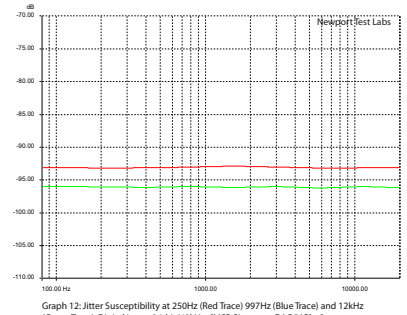
Graph 5. THD @ 1kHz @ -90.31dB recorded level. (With dither) [MSB Signature DAC IV Plus]



Graph 11: Suppression of Imaging Components. Left channel (Red Trace); Right channel (Blue Trace). Digital input. 24-bit/48kHz. [MSB Signature DAC IV Plus]



Graph 6. CCIF Distortion (Twin-Tone Intermodulation) @ 1kHz @ 0dB using 19kHz and 20kHz test signals in 1:1 ratio. [MSB Signature DAC IV Plus]



Graph 12: Jitter Susceptibility at 250Hz (Red Trace) 997Hz (Blue Trace) and 12kHz (Green Trace). Digital input. 24-bit/48kHz. [MSB Signature DAC IV Plus]

these are measured wideband, by the way, and not band-limited) were measured at 103dB unweighted, increasing to 109dB with A-weighting. Again, superb figures that mean you will need to pay more attention to your choice of amplification and the way you run your signal wires, as it's likely these will be responsible for any noise in your system, rather than the MSB. Note, too, that these figures are for the 44.1/16-bit test signal. As you can see from the table showing the measured results for a direct-injected 48/24 digital signal, the signal-to-noise ratio improved to 123dB.

As you can see from the tabulated figures, the MSB doesn't have a de-emphasis circuit, but this will only be an issue if you own lots of thirty-year old CDs from 'way back in the early 80s, when the technology was so bad that CD manufacturers pre-emphasised the music they recorded on disc to reduce noise levels. If you do have such discs, and play them back using the MSB, nothing untoward will occur: the discs will just sound rather 'brighter' than they should.

Linearity error was vanishingly small and very uniform across the various recorded levels tested. What was quite surprising to me was the moderately high power consumption of this MSB DAC, even when it was in standby mode. You won't need to fret about your power utility bills though: it draws less power from your 240V mains than a single light bulb when it's operating.

The major problem measuring a component of the high standard of the MSB Signature DAC IV *Plus* is that its performance is so close to the limits of what's technically possible that even using the finest test equipment in the world—and that's precisely what *Newport Test Labs* uses—testing variables such as how interconnecting wires are routed are significant enough to affect the measured results. In practise, you will get far more variances by adjusting the MSB's own parameters, as shown with the series of oscillograms that is included, which shows the effect of the MSB's four different filter settings on both square waves and pulses. So in the end, you can see that it will be the DAC settings you employ while listening that will have the greatest effect on the overall sound quality rather than the underlying technical performance of the MSB itself.

But if you do need me to tell you about the underlying technical performance of the MSB Signature DAC IV *Plus*, I only need to use one word: Brilliant. ***Steve Holding***

MSB Signature DAC IV Plus 44.1kHz/16-Bit Test Results

Analogue Section	Result	Units/Comment
Output Voltage	3.5320 / 3.5327	volts (Left Ch/ Right Ch)
Frequency Response	See Graph	dB (20Hz – 20kHz)
Channel Separation	116 / 121 / 143	dB at 16Hz / 1kHz / 20kHz
THD+N	0.005%	@ 1kHz @ 0dBFS
Channel Balance	0.001dB	@ 1kHz @ 0dBFS
Channel Phase	0.00 / 0.00 / 0.56	degrees at 16Hz / 1kHz / 20kHz
Group Delay	-3.20 / +5.31	degrees (1–20kHz / 20–1kHz)
Signal-to-Noise Ratio (No Pre-emph)	103 / 109	dB (unweighted/weighted)
De-Emphasis Error	Cct Not Fitted	at 1kHz / 4kHz / 16kHz
Linearity Error @ –60.00dB / –70.00dB	0.01 / 0.06	dB (Test Signal Not Dithered)
Linearity Error @ –80.59dB / –85.24dB	0.02 / 0.01	dB (Test Signal Not Dithered)
Linearity Error @ –89.46dB / –91.24dB	0.07 / 0.04	dB (Test Signal Not Dithered)
Linearity Error @ –80.70dB / –90.31dB	0.07 / 0.05	dB (Test Signal Dithered)
Power Consumption	21.41 / 45.37	watts (Standby / On)
Mains Voltage During Testing	244 – 254 volts	(Minimum – Maximum)

MSB Signature DAC IV+ (AES-17 Standard using 48kHz/24-Bit)

Digital Section	Result	Units/Comment
Out of Band Spurious Components	–116.161	
Suppression of Imaging Components	–102.849	(Worst Case)
Level Dependent Logarithmic Gain	5.178dB	
Intermodulation Distortion (1)	79.802	18kHz/20kHz 1:1 Ratio
Intermodulation Distortion (2)	72.506	41Hz/7993Hz 4:1 Ratio
Low Level Noise Modulation	11.765	Worst Case
Idle Channel Noise	–123.423	CCIR-RMS weighting
Signal-to-Noise Ratio	–123.694	CCIR-RMS weighting
Power Line Products	–123.141	50Hz
Non-Linear Interchannel Crosstalk (a)	–129.167	3kHz (2nd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (b)	–131.270	6kHz (3rd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (c)	–130.320	10.040kHz (2nd re 40Hz/10kHz)
Non-Linear Interchannel Crosstalk (d)	–114.592	10.080kHz (3rd re 40Hz/10kHz)
Absolute Phase	Non-Inverting	Normal/Inverted

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